



United States  
Department of  
Agriculture

Forest  
Service

Northeastern Area  
State and Private Forestry

180 Canfield Street  
Morgantown, WV 26505-3101

File Code: 3410

Date: October 12, 2006

Mr. Dwight Beall  
Raystown Lake  
US Army Corps of Engineers  
RR1, Box 222  
Hesston, PA 16647

Dear Dwight:

On September 28 and October 10 and 11, 2006, USDA Forest Service personnel conducted a gypsy moth egg mass survey at Raystown Lake. The purposes of this survey were to assess the potential for defoliation and the need for treatment in four areas that the US Army Corps of Engineers had proposed for treatment in 2007 (Figures 1a-1d). The four areas total approximately 1683 acres and are valued for recreational purposes, wildlife habitat, aesthetics and or timber production.

Gypsy moth survey plots were randomly selected based upon available host trees (oak species), size of sample area and uniformity between egg mass counts. At each sample point, a 1/40<sup>th</sup> acre fixed radius plot was established. The plots consisted of a tally of all the new (2006) egg masses observed on the overstory trees, understory vegetation, ground litter and duff. The total number of egg masses observed for each plot was multiplied by 40 to determine the number of egg masses per acre. Egg mass lengths were also measured at the plots to determine the overall "health" of the existing population and as a measure of egg mass fecundity.

The location of the survey plots are also shown in Figures 1a-1d. The summarized results of the survey are presented in Tables 1-4. In brief, egg mass densities in the four proposed treatment areas ranged from 0-10,320 and averaged 1495 egg masses per acre. Overall egg mass length tended to be moderate to large in size, ranging from 20-46 mm and averaging 30 mm. Egg masses larger than 25 mm typically indicate healthy populations.

Egg mass densities in block 1 (Susquehannock Campground) ranged from 0-3800 and averaged 765 egg masses per acre. Egg mass densities in the southern portion of this block were the highest and averaged 1400 egg masses per acre. In the northern portion of the block, egg mass densities averaged only 130 per acre.

Egg mass densities in block 2 (across from Seven Points Recreation Area) ranged from 0-10,320 and averaged 1760 egg masses per acre. Egg mass densities in the upper portion of the block were the highest and averaged 3736 egg masses per acre. Egg mass densities in the lower portion of this block averaged only 113 per acre.

Egg mass densities in block 3 (Trough Creek) ranged from 160-5680 and averaged 2793 egg masses per acre while egg mass lengths in this area ranged from 24-34 and averaged 28 mm.



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In block 4 (Gate 35), egg mass densities ranged from 0-3720 and averaged 1209 egg masses per acre. Egg mass densities in the northern and central portion of this block were the highest and averaged 1460 egg masses per acre. Egg mass densities in the southern portion of this block averaged only 40 per acre.

The survey results indicate that areas of moderate (31-60 percent) and heavy defoliation (61-100 percent), are likely to occur in the southern portion of block 1, upper portion of block 2, block 3 and the northern and central portions of block 4 (Figures 2a-2d).

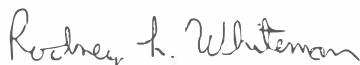
This defoliation prediction is further supported when egg density is also used as a means of estimating gypsy moth population densities. Moore and Jones (1987) found that estimating the mean fecundity would increase the precision of gypsy moth density estimates and that a linear relationship exists between egg mass length and fecundity. Further work by Liebhold et al., (1993) demonstrates that the product of the mean egg mass length (mm) and egg mass density provides a more precise means of estimating population densities and predicting defoliation. Using Liebhold's model, Figure 3 shows how this information can be used to correlate the predicted defoliation of an area. Accordingly, the estimated egg mass density of 2793 per acre (average egg mass density in block 3) x 28 mm (average egg mass length in block 3) translates to a projected defoliation level of about 64 percent (heavy defoliation). Because egg mass densities and host type are not evenly distributed, actual defoliation will vary from tree to tree but will be predominately heavy throughout this area. Heavy defoliation is also expected for the upper portion of block 2 while moderate defoliation is expected in the southern portion of block 1 and northern and central portions of block 4.

We concur with the need for treatment in the areas where defoliation is likely. We recommend a single application of Bacillus thuringiensis var. kurstaki (Btk), applied at the rate of 38 billion international units (BIU's) per acre on approximately 1063 acres (Figures 2a-2d). With proper application, gypsy moth defoliation should be minimal and a significant population reduction should be obtained.

If needed, I will provide Jeff Krause's assistance in developing the gypsy moth suppression contract.

Please call me at 304-285-1555 if you have any questions regarding this egg mass survey report.

Sincerely,



RODNEY L WHITEMAN  
Forester  
Forest Health Protection

Cc: Don Eggen, PA BOF  
Alan Sior, PA BOF  
Lacy Evans, Baltimore District ACE  
Noel Schneeberger, AO

## REFERENCES

Liebhold, A.M., Simons, E.E., Sior, A., and Unger, J.D, 1993. Forecasting defoliation caused by the gypsy moth from field measurements. *Environ. Entomol.* 22(1): 26-32.

Moore, K.E.B. and Jones, C.G. 1987. Field estimation of fecundity of gypsy moth (Lepidoptera Lymnatriidae). *Environ. Entomol.* 16: 165-167.

Table 1 – Gypsy moth egg mass survey results in block 1 (Susquehannock Campground) at Raystown Lake, September 28, 2006.

Plot number	Number em/acre	em size
1*	3800	32,26,22
2*	120	36
3*	960	32,26,22
4*	720	32,22,24
5	160	30,36
6	320	34,20,46
7	40	34
8	0	--

em/acre range = 0-3800  
em/acre average = 765

em size range = 22-36 mm  
em size average = 30 mm

em/acre range\* = 120-3800  
em/acre average\* = 1400

em size range\* = 22-36  
em size average\* = 27 mm

\* = located in recommended treatment area

Table 2 – Gypsy moth egg mass survey results in block 2 (across from Seven Points) at Raystown Lake, October 10, 2006.

Plot number	Number em/acre	em size
1	80	--
2	0	--
3	360	28,42
4	40	
5	0	
6	200	
7*	640	30
8*	1880	26,30
9*	3560	26,34,32
10*	10320	24,26,22
11*	2280	32,34

em/acre range = 0-10320  
em/acre average = 1760

em size range = 22-42 mm  
em size average = 30 mm

em/acre range\* = 640-10320  
em/acre average\* = 3736

em size range\* = 22-34  
em size average\* = 29 mm

\* = located in recommended treatment area

Table 3 – Gypsy moth egg mass survey results in block 3 (Trough Creek)  
at Raystown Lake, October 10, 2006.

Plot number	Number em/acre	em size
1	3280	32,26, 24,30
2	160	28
3	1520	32,26,24
4	4160	34,28
5	1960	26,30
6	5680	30,24,26

em/acre range = 160-5680  
em/acre average = 2793

em size range = 24-34 mm  
em size average = 28 mm

All plots located in recommended treatment area

Table 4 – Gypsy moth egg mass survey results in block 4 (Gate 35)  
at Raystown Lake, September 28 and October 11, 2006.

Plot number	Number em/acre	em size
1	120	--
2	0	--
3	0	--
4*	2620	46,28,28
5*	3720	28,26,34
6*	240	38
7*	400	32
8*	0	--
9*	80	34,32
10*	80	--
11*	3480	42,36,34
12*	3480	38,32,30
13*	1680	36,20
14*	40	--
15*	320	44
16*	2160	38,36
17*	2140	42,44,24

em/acre range = 0-3720  
em/acre average = 1209

em size range = 20-46 mm  
em size average = 34 mm

em/acre range\* = 0-3720  
em/acre average\* = 1460

em size range\* = 20-46  
em size average\* = 34 mm

\* = located in recommended treatment area

Figure 1a. Proposed spray block and egg mass survey plot locations in block 1 at Raytown Lake.

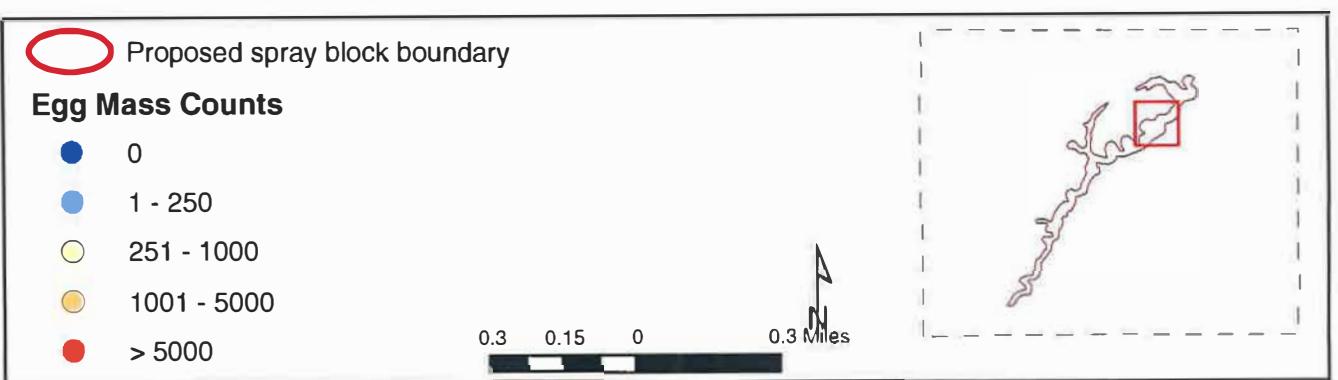


Figure 1b. Proposed spray block and egg mass survey plot locations in block 2 at Raytown Lake.

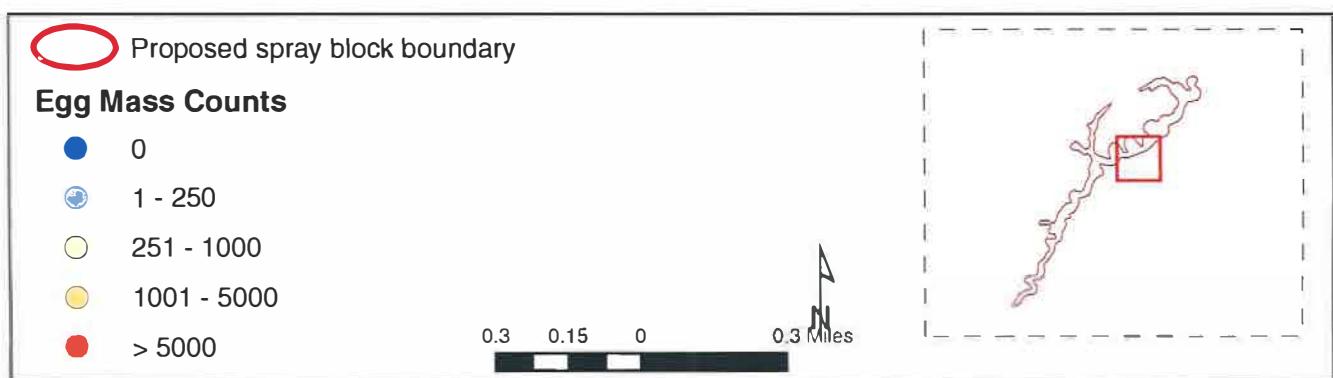


Figure 1c. Proposed spray block and egg mass survey plot locations in block 3 at Raytown Lake.



Proposed spray block boundary

**Egg Mass Counts**

- 0
- 1 - 250
- 251 - 1000
- 1001 - 5000
- > 5000

0.3    0.15    0    0.3 Miles

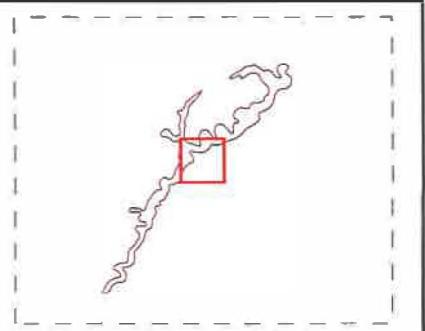


Figure 1d. Proposed spray block and egg mass survey plot locations in block 4 at Raytown Lake.

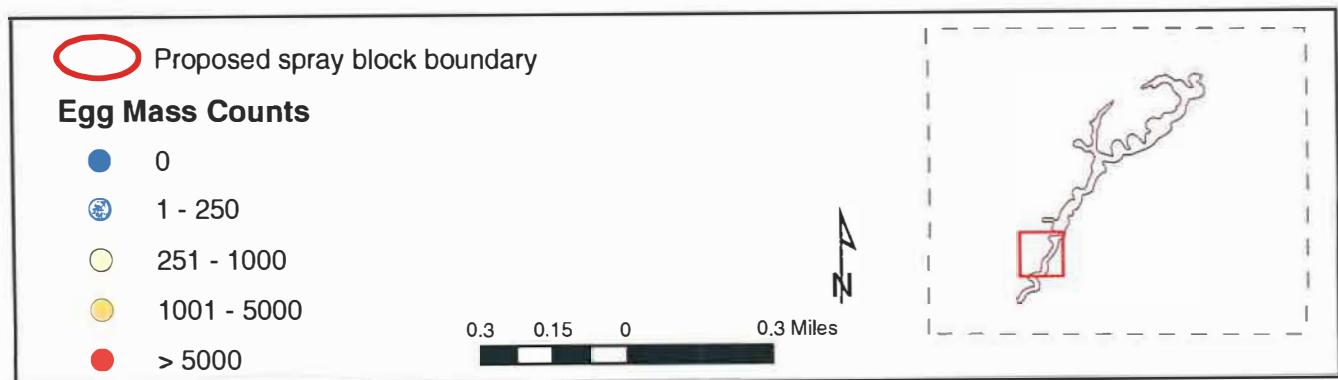


Figure 2a. Area where defoliation is likely in 2007 / Recomended treatment area in Block 1.

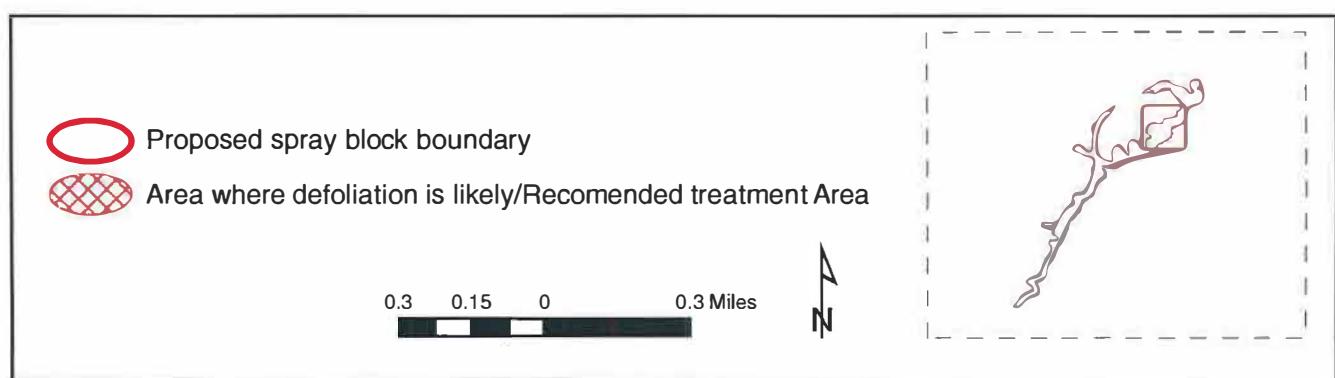


Figure 2b. Area where defoliation is likely in 2007 / Recomended treatment area in Block 2.

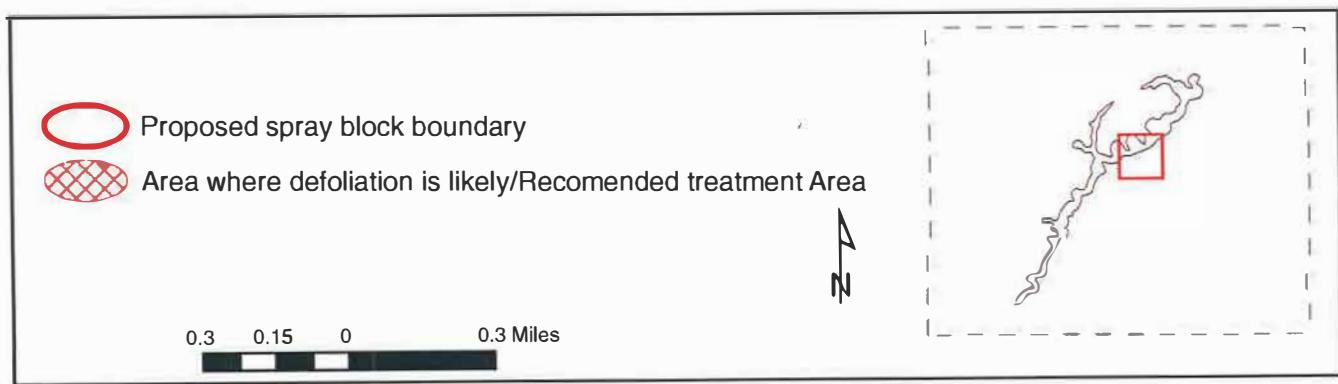


Figure 2c. Area where defoliation is likely in 2007 / Recomended treatment area in Block 3.

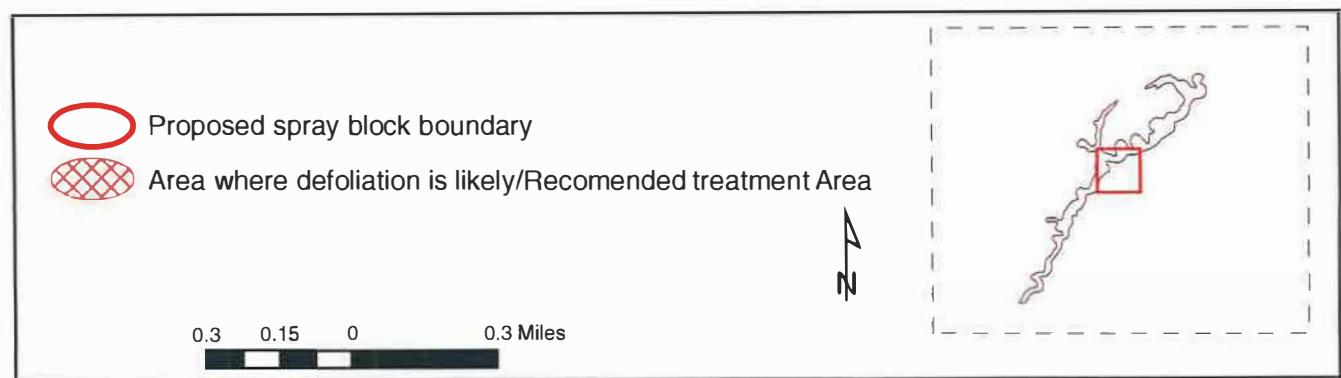
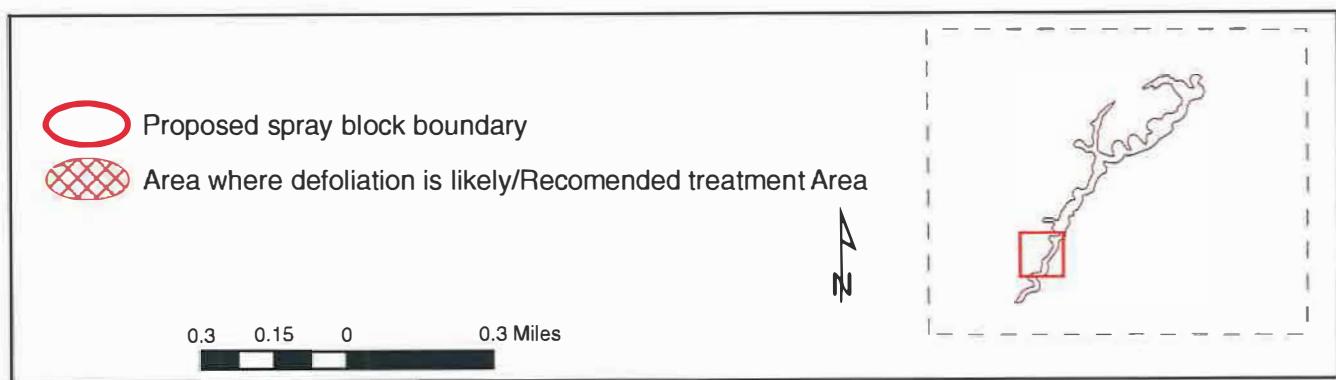
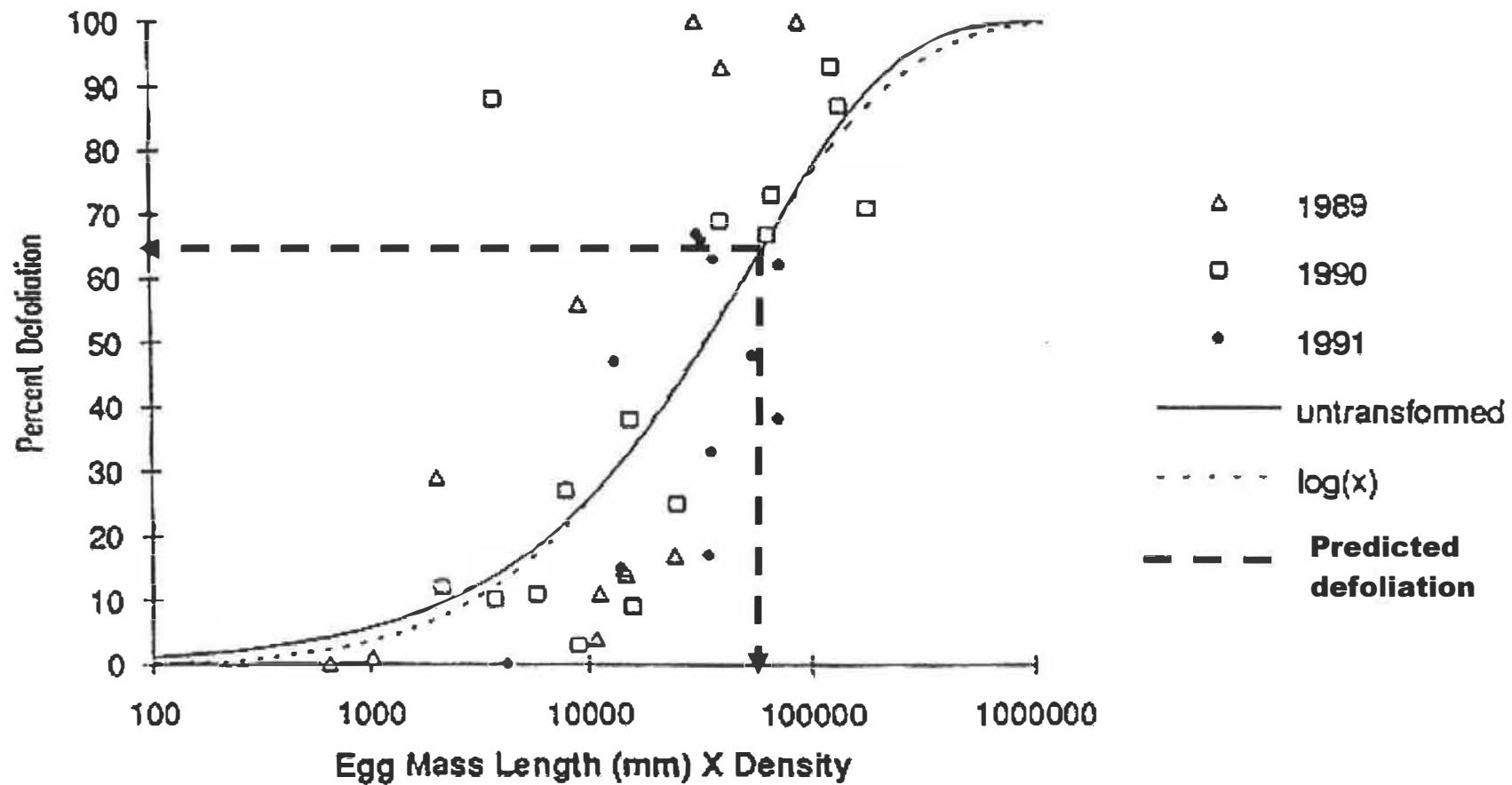


Figure 2d. Area where defoliation is likely in 2007 / Recomended treatment area in Block 4.



**Figure 3.—Predicted defoliation in block 3 at Raystown Lake in 2007.**



**Scatter plot of the product of mean egg mass length and egg mass density versus mean defoliation.**  
Extracted from Liebhold et al. (1993).